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SIGMA XI QUARTERLY

VOL. XXI

JUNE, 1933

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OUR NEW CHAPTERS

We welcome into our great society two new chapters, one at Duke University, our sixty-first, and one at the University of California at Los Angeles, our sixty-second. The influence of Sigma Xi is profoundly felt in educational institutions where there is a research atmosphere and attitude, and is exerted either in chapter or club in almost every one of the forty-eight states of the United States. North and South, East, Middle West and West, in all sections of the country, the cause which Sigma Xi embodies is maintained and advanced by the splendid work of all our branches, by the presentation and discussion of scientific subjects, by developing and maintaining sympathetic relations among investigators in scientific centers, by the inspiration and encouragement given students who in the years of their training have shown promise of, or exhibited, research ability, by publishing results of research, and by offering financial support to investigators in many fields of science. The importance and influence of Sigma Xi expands and deepens with the years. There will be an inspiring story to tell the scientific world at our semi-centennial in 1936.

SIGMA XI AND RETRENCHMENT IN FEDERAL BUDGET

Six chapters and clubs, including Cornell, our parent chapter, have asked the National organization to make an appeal to President Roosevelt to safeguard the cause of research and actual research work in progress under Federal auspices, when curtailing the national budget. This is a very important matter. On the one hand, progress along many lines is dependent on the research work encouraged and supported by the government. On the other hand the national budget must be reduced and balanced. The problem which faces every organization, Federal and State and private, is one of saving money and at the same time of preserving standards and necessities. The question confronting the authorities in Washington is not so much "what can we get along without" as "what can we not get along without." Acting upon the authority given by a majority vote of the National Board of Officers of Sigma Xi, the secretary despatched the following message to the President:

"Sigma Xi, an international organization for the promotion of scientific research, numbering over twenty-five thousand members, with branches in ninety prominent educational and research institutions, respectfully and urgently asks that in making retrenchment in the national budget the government conserve in every possible way important and valuable research work now in progress under Federal auspices in many centers throughout the country."

These are very difficult days for the government, for business, for professions, for education. They are a challenge to our intelligence. We shall emerge from them chastened and wiser. In the next decade, we must apply with intelligence and wisdom what we have learned during the last decade. Here is one of the broadest opportunities and privileges for Sigma Xi which the society has ever faced throughout its long and successful history.

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MAN, THE SPEAKING ANIMAL*

MELVILLE J. HERSKOVITS

Man, it is said, is a speaking animal. Language, and the use of tools are the two characteristics which mark off *homo sapiens* from all the other species that go to make up the animal world. And it is our task this evening, to investigate what, if anything, is known of the origin and development of the first of these two criteria of humanness—the power of speech—and what can be gained, if anything, in the way of understanding the stuff of language itself, from a consideration of the languages spoken by the men who populate the earth today.

The development of Man in prehistoric times, and the story of his inventions and discoveries in the early stages of his existence on earth, recount an adventure that must inevitably stimulate the imagination of those who consider his course down the ages. In the past few decades, our attention has been increasingly directed to the recovery of this story, with the result that many attempts have been made to understand the origins of the complicated structure of behavior and belief that we subsume under the term "civilization." This is but natural, for, as we look about us at the world of man as it exists today, and as we consider how man has adapted himself to his environment and devised for himself the means of attaining an adjusted life, we find such difference in the details of structure of civilization, and so much ingenuity in its organization, that the questions whose answer is sought by the prehistorian are inevitable—why, how, and where these phenomena have arisen, and how they have developed into what we find on earth today.

The earliest philosophers who contemplated the life of man were more concerned with the reason for being of civilization than in recovering the details of its development; science, with its insistence on an understanding of processes as a prerequisite to the consideration of ultimates, busied itself with an attempt to reconstruct the manner in which this development actually occurred. The attack was along two fronts. On the one hand, there were the prehistorians; men, who in various parts of the world but especially in Europe, by direct attack, wrested the secrets of the past from the earth itself. On the other hand, there were those who, through the study of contemporary peoples who had not developed the technique of writing and who possessed what were considered to be "simple" civilizations, and through the devising of systems of evolutionary processes, postulated, by the exercise of a logical rather than field technique, "laws" of cultural development. And it is because we must consider these two methodologically opposed approaches to the study of man's past, before proceeding to our subject of the evening's discussion—language—that I must digress as I am going to.

Now this latter attack on the problem stimulated some of the most brilliant minds of the late nineteenth century, and, so persuasive were the writings of these men, that the method they devised for the reconstruction of the develop-

* A lecture delivered before the University of Pittsburgh Chapter of the Society of Sigma Xi.

ment of social institutions and customs and techniques came to be recognized as the accepted one through which this problem was eventually to be solved! The diggers were also working, just as steadily, but their empirical approach made for somewhat more obscurity in presentation than was the case with their more literary colleagues. However this may be, as they dug, the data began to accumulate. Type after type of prehistoric physical form was found; site after site where these early men lived their crude existences, was excavated. Sequences began to appear; not only sequences of development in physique away from the lower forms of life toward that which we today recognize as human, but sequences of cultures which became more and more complicated, and which were made up of traits that became more and more finished, as they neared the present.²

What today is the status of these two methods of approach; what, at the present time is the scientific validity held for each? The diggers, the empirical workers, who amassed their data at the gruelling cost of the physical effort expended by the field archaeologist, have gone on from fact to fact, so that, in broad lines, we have a steady and well-founded base on which to construct hypotheses of the prehistoric development of man and of his civilizations. The students who approached the problem from the point of view of a *a priori* methodology, however, have not fared as well at the hands of posterity. Today, when we mention the names of such men as Tyler, or Morgan, or Frazer, or Crawley, or Müller, while we speak with full recognition of their genius, we also speak of an approach which, marking a stage in the development of anthropological science, has ceased to be of active concern to the working anthropologist. For while the field archaeologists were working at their digging, and the social philosophers, as we may term these other students, were developing their hypotheses, another technique, that of the field ethnologist, was being developed. As it developed, and the methodology it employed became more and more refined, strange facts began to come to light that could not in any conceivable way be fitted into the patterns of the evolutionary system of "stages" of the evolution of culture postulated by the social philosophers.

It began to be discerned that in spite of the etymology of the term "primitive"—which means "first" man—yet primitive man and prehistoric man were not always the same, and hence, that it was not permissible for us to think of primitive peoples as our "contemporary ancestors." It also began to be found that one of the most prized dicta of the evolutionists, that social evolution is from the simple to the complex might not be tenable, for it became increasingly apparent that what seemed to be a simple culture could, if judged by other of its characteristics, be an exceeding complex one, and that, even if we took as examples of "simple" cultures the ones that had been designated as such by the early social philosophers, the expected findings in many phases of the lives of the people who lived in them were not to be discovered. Let me illustrate my meaning with an example from the phase of life that the anthropologist designates as "social organization." Let me consider especially the sub-division of this phase of life that we speak of as the family. The

early social evolutionists felt that, since the customs of our civilization must be taken as representing the apex of development, that beginnings of a given trait of human culture must be sought in a "stage" of progress as far different from our customs as it might be possible to conceive. What type of family is most unlike the monogamic family? Obviously, no family at all, but a kind of sexual promiscuity. Since it was assumed, however, that all existing societies had progressed beyond this "stage" of evolution of the family, it was postulated that we should as the next "stage" expect to find a situation where the promiscuity was restricted to the people who comprised a group within a society; hence the stage that was called "group-marriage." This was satisfactorily proved, so the early social philosophers felt, by the fact that in many societies a man called all his mother's sisters "mother," and all his father's brothers "father." Yet what are the facts as the field ethnologist found them to be? There need be no such complicated explanation as that which the concept of "survival" entails, for even where a man calls all his mother's sisters by the term "mother," we know that he is in no doubt as to who his real, his biological mother may be. What we see in this arrangement is simply a device for the regulation of marriage and the prevention of incest. All those who are daughters of anyone I call "Mother" are, logically, my "sisters," and my sister obviously, I cannot take as my wife. But this was not all. It was noticed that the crudest civilizations, where peoples the evolutionists pointed to as being on the lowest rung of the evolutionary ladder were found, such as the Bushman of South Africa, constituted just the places where monogamy is the rule, not promiscuity or group marriage. And, if another point were needed to show the untenability of the evolutionary position, it was found that if the processes of evolution were postulated to be from the simple to the complex, then an evolution that started with the almost unbelievable complexity of the Australian organization of relationship groups and developed into the extremely simple one of our present culture, must be a queer kind of progress, indeed!¹³

But I must not labor a point that has been made so often and so thoroughly that, in advancing it, I lay myself open to the charge of setting up a straw man, only to knock him down to show my own valor. What I have said concerning the evolutionary theory of the reconstruction of human development is of real importance for our discussion of the origin of language, for it brings up the whole matter as to the extent to which the origin of such an intangible as language can ever be recovered.

Let us turn once more to the diggers, the men and women who wrested from the soil the secrets of the development of humanity. What sort of material have they found as a result of their work? They have found flint tools. They have found, in later periods, bone implements. They have found, as you well know from the first discussion of your series, the manifestations of the aesthetic impulses that surged so strongly in early human beings. Then, for epochs that, in terms of the vast sweep of prehistoric time we must regard as but yesterday, they have found shreds of the pottery man made, remains of the houses he built, bones of the animals he domesticated, indications as to

the grains he cultivated. That they have done this is no small achievement, and how thrilling a thing it is, is not for me to tell, but rather your next speaker. For it is my task to discuss something that falls in that division of human civilization which the anthropologists classify as "non-material" culture. Of the ideas of the men who lived in the earliest time, we know nothing. We may assume that Neanderthal man worshipped his gods and believed in an after-life because we find skeletons of persons who have been given burial and, when buried, had had fine implements and choice joints of meat buried with them. We may infer, on the basis of customs found among peoples living today, that these implements and this food was placed in the grave so that the souls of those who had been buried might make their way in the other world. But the cautious field archaeologist never forgets that though this is a proposition which his scientific imagination tells him is a likely one, yet it is one that he must never forget is only an hypothesis.

Let us take another example to illustrate what I mean. It has been said that prehistoric man painted those magnificent representations of the animals he hunted so that he might have magic control over them. Now, I should be the last to insist that such an hypothesis were fallacious. Yet I should hesitate, as I have hesitated, to accept it. For we must not forget that culture is an historic phenomenon. When I say this, I mean, for one thing, that, unlike the material with which the physical scientist deals, is not subject to laboratory control. And the implication of this is that while an historic fact, such as the development of an art style, or, what is more to the point, the propelling urge that is behind an art and gives it its cultural reason for being and its meaning, has come about through the operation of a chain of causal phenomena, yet guess though we may as to the details of this series of events, we can never be sure that our guess is a correct one. And so, though it may well be true that the Magdalenian artist painted his bison on the walls of his cave so that a high-priest might invoke the spirit of the real bison and bring them under the weapons of the hunter on the morrow, I may also assume that the painting was the work of men who were not efficient in the hunt, who could not compete with their fellows, and who, smarting under the taunts of those others more capable than they, withdrew into the recesses of the caves and compensated by capturing in line and color the bison they could not slay. Now, it must be understood that I am not advancing this even as a working hypothesis; I am merely attempting to illustrate a point in method. And that point is this: In arguing from the present-day life of primitive folk it seems logical to you that those paintings of bison were for purposes of magical control, and if, on the other hand, it seems to me, arguing from postulates set forth by the psychoanalysts, that they are remains of the early working of an inferiority complex, it is not for me to say that you are wrong, nor for you to say that I am mistaken, though I am sure we will both think this of the other. We have each used our scientific imagination to different ends, that is all. Empirically, the paintings are there, and the paintings in themselves are as mute as to the reason that brought them into being as the rocks on which they have been designed.

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Let us remember, then, that the same thing that is true of the origin of an art style is true of religious beliefs or the way in which the family was organized in prehistoric times; that this is true of all other phases of those earliest civilizations, and of all civilizations, indeed, which have not presented us with written records. As a matter of fact, we can press the argument even farther, for the same thing is true of even the material aspects of culture that did not have sufficient resistance to survive the vicissitudes of time. Did the Acheulian people have wooden houses? Who can tell? Did the Chellean people have any means of crossing a river? Or, to come closer home and nearer in time, what were the designs stitched on the clothing of the earliest Indians? Questions of this type cannot be answered unless definite archaeological remains are found. Hence such questions are like those which demand information as to the earliest forms of folk-lore, or music, or dancing. Especially do non-material things disappear when a people vanish, so that when those who told the stories, or sang the songs, or danced the dances, died, these things died with them. But all I have said of religion, and family organization, and artifacts made of perishable materials, and music, and dance, is supremely true of language. How did language commence? Again, who knows? We are not even certain as to when human beings began to speak in terms of intelligible speech, of language, though of that I shall have more to say presently.

Is this not a negation of what I have come here to discuss with you? In a sense, perhaps, but only in a sense. Have we explored all the possibilities you may ask? Even though the reasoning of the social philosophers of the evolutionary school be admittedly fallacious, can we not in some measure turn to primitive man? Can we not here obtain, in some measure, a clue which, while strictly speaking will not give us the prehistory of language, yet may give us an idea, even if only a general idea, of how language developed, or of what its earlier forms were like?

Again, I am afraid, the answer is not satisfactory to those who are searching for origins. The quest of them dies hard, due to the magnificent writing and persuasive reasoning of the evolutionary school of social philosophers. For, I must again repeat, we know today that to think of living primitive peoples as the equivalent of our prehistoric forbears is a fallacy that cannot be justified. Let us look for an instant at the nature of culture itself—and I am thinking, even though I may not be speaking directly, of that phase of culture in which we are most interested this evening—language. If there is any one thing that characterizes culture, it is the fact that it is inbred and not unborn. As Herbert Spencer so aptly phrased it, it is the superorganic, and to be contrasted with the organic make-up of man's biological endowment. One of the most important things that modern ethnological field-work has discovered is that primitive peoples have fads and fashions in quite the same way as we ourselves do. And, when we consider it, this is not so very strange, for, if culture is something super-organic, that means that it is something that is learned. It was this fact that I referred to when I said that when a man dies, the song he sang, the dance he danced, the ideas he had stood for, die also.

It is true that they live on in the persons who may have learned them from him. But in the transmission of these cultural facts from one generation to another, there is always some change. It is quite true we think of primitive culture as something of a cross between a straight-jacket and a chamber of horrors. A slave to tradition, frightened by the universe in which he lives—it is something like this that that mythical entity, "the savage," is described. But again, the ethnologist of today does not make such a description, it is the traveller or arm-chair philosopher who has not only not had contact with primitive people, but whose ideology is that of an anthropological generation that has disappeared.

For culture is essentially dynamic. No one ever learns to do or think anything, I think I am safe in saying, exactly as his teacher did it or thought it. And so, in all civilizations, there is constant significant change, no matter how crude the civilization of a given people may seem, no matter how conservative, no matter how isolated. But, what is more, this small measure of change is not all. There are these fads I mentioned. Australians are among the most "primitive" folk we know, but since the time they have been discovered several religious revivals—I do not mean revivals induced by missionary exhortation, but new fashions in native beliefs—have swept across the continent. And of this sort of thing I could cite case after case, and utilize for my examples peoples who live in all parts of the world. Radical change in culture is not by any means the unique possession of our civilization.

And so we come to our methodological point in the study of linguistic origins. As to the absolute origin of language, we must recognize that this is lost in the deep haze of time, and can never be recovered. Some students of language, such as Jespersen,⁴ attempting to reconcile the old urge to search for origins with that of the newer empirical scientific method, state that we must begin with written European languages and, by analyzing them in their known historic development, plot certain lines along which they have changed from their earlier forms into the later. Then, by a kind of extrapolation; extrapolation, it is true, into the unknown past instead of the unknown future, we may infer that the logical backward movement which, for a limited period, we can check by known data, continues into the past until we come to a place where all the lines meet. This, then, will give us the original tongue of man. Of course, this technique is an improvement over the pure *a priori* methodology of the evolutionists who excogitated their "origins." Yet I am sure that, on the basis of what has already been stated, you must recognize the fact that a guess is a guess, even though it be called by a term as impressive as extrapolation (the word is mine, not Jespersen's). We must understand that even though our guess be based on a certain amount of established fact, once we reach the point where it becomes hypothetical it is just as methodologically invalid, when its feet leave the sound bottom of known data and it strikes out to join those other theoretical assumptions that swim about in the sea of speculation, as any other hypothetical assumption. Besides, if you are familiar with the work to which I refer, you will recognize, especially in the last chapter where the author brings his ideas into focus, that we find once more, in spite of lip-service to the newer methodology, that the theory must be bolstered by

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reference to primitive languages, and that once more we are fronted with the assumption that a primitive people equals a prehistoric one.

Is there anything, then, that prehistory can tell us about the début of man on the stage of time as the first character to have a speaking part? Or must we give up the search in despair? Or is there, perhaps, an alternative to these two positions? I believe there is an alternative; that just as the students of primitive religion, or primitive social organization, or primitive music, have given up attempting to find "origins" and have concentrated upon the study of processes with amazingly fertile results, so the students of language have found that, to the extent to which they have studied processes instead of searching for origins, they have been repaid in a measure which they have perhaps, never dreamed possible. And, when I say this, I do not mean that prehistory has nothing to contribute to an understanding of how and when and under what conditions language began. There is, further, no more reason why scientific imagination should not operate in the field of deduction as to linguistic activity than it should in that of any other kind of activity of a non-material sort, and it is both of this, and of the study of linguistic processes, that I shall speak. But before I do so, I wish to show once more how, in the linguistic field as well as in the field of other phases of cultural activity, the search for origins is of a hoary respectability. Let us look at some of the hypotheses that have been advanced as to the way in which language began, even though you realize with me that we are merely stating propositions that are no longer marked with the stamp of scientific acceptability.

There have been those who, by experimental method, have attempted to understand how language might have developed, by considering the sounds made by children who have been left to grow, away from human contact. The earliest, perhaps the most famous, of these experiments was that carried out by an Egyptian king and reported by Herodotus. Tyler⁵ tells of many others, one of which was attempted by the great Mogul, Akbar Khan. In this case, as in all the others, however, the subjects of the experiment failed in the task set for them, since they were found to "speak no language at all." Now I think you will agree with me that this result is not a strange one. For though the power to speak has its physical basis in the structure of the vocal organs, the mouth, and the nasal passages, the use that will be made of the sound producing apparatus is something that is quite otherwise determined. If I may use an analogy, I may perhaps refer to the relationship between a civilization and the natural environment in which it is set. The environment places certain limits which mark the extent to which a culture may develop. But to recognize this limiting rôle of the environment is very different from holding that the environment lays down, in an affirmative manner, the way in which the civilization must develop. There may be never so much coal in the ground, but unless a culture is prepared to recognize and utilize coal for fuel purposes, it is to be considered as only so much rock. The analogy between this example and the relationship between language and the power to utter the sounds of language, I feel, is something of the same order. The actual sounds that the

human vocal equipment is able to make are almost infinite in number; indeed, they shade so intimately one into another that in the study of many exotic tongues, it takes the keenest of ears to detect the differences between two phonetic elements that, to the native, are perfectly apparent and behave in a perfectly regular way in the grammatical structure of the language of which they form a part. So we must conclude that it is not the sounds that it is possible for the vocal equipment of man to produce which make the language. It is those sounds that have been selected by a people, and the social significance given these sounds, that make it. So that, though the number of sounds that a man can make approaches only infinity as a limit, the number that any given social group will select, and stylise so thoroughly that the persons who speak a given language will hear no others, is extremely restricted. Therefore it is obvious to you, I am sure, that the sounds made by a person who had never been exposed to human culture, while they might even consist, for himself, of a system of sorts, would have none of that social significance which is the quintessence of linguistic expression. In a word, we must recognize that it takes at least two to make a language. This, as a matter of fact, is my justification for making comparisons between all sorts of cultural phenomena and language; it is because language, though a highly specialized phase of culture, is a cultural phenomenon none the less. And being a phenomenon of this order, it is obvious that an experiment attempted on the basis of the isolation of an individual must, *ipso facto*, be doomed to failure and to be utterly lacking significance.

There have been other empirical attempts to solve the question as to the origin of language. Man evolved from a simian form; what, then, are the facts with regard to possible linguistic activities on the part of the lower forms, particularly the anthropoid apes? Here again the results have not been very satisfactory. Yerkes and Yerkes,⁶ in their monumental work on the anthropoids, have reviewed all these investigations at some length, and while it is true that Boutan, a French student, thought he could distinguish a few words as spoken by a white-cheeked gibbon, he finally came to the conclusion that the vocal expressions of this animal are instinctive and practically independent of the experience or special training of the individual.⁷ And this, I need not remind you, is not the stuff of language, which must be regarded as the identification of certain arbitrary sound-symbols with certain experiences in the life of those who employ these symbols. Yerkes also reports⁸ that while they have "heard the chimpanzee whine, moan, groan, grunt, bark, shout, yell, hoot and scream," that they could never feel "sure that the term speech could be fittingly applied to such utterances." It seems apparent, certainly following this most careful of all studies of the anthropoid apes, that we have nothing much to learn from these creatures as to how language began.

There are still other theories that merit mention in this review of attempts to understand how human speech and linguistic expression began.⁹ There is, for example, the one which holds that language originated in an attempt to imitate sounds made by objects; that such words as "gurgle" in our language, or "tsuch," "to tear a cloth" in that of the Kwakiutl Indians, have originated

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in this manner and represent vestigial remains of what once constituted speech. Yet what proof is offered of this? If we turn to primitive languages, we find that there are all sorts of social reasons for onomatopoeia in some, and none in others; that people equally primitive employ this device or neglect it. The same is true of the "interjectional" theory of language, which maintains that language is a development from the cries which people instinctively make when, let us say, a man stubs his toe, or crushes his hand, or when he is surprised or frightened or angry. Yet a cry which I am sure every one of you would identify as one of pain, one which occurs in a West African language spoken in Liberia, Kru, which consists of a long-drawn out open "o" that goes from a middle to a high to a low tone, is merely the symbol which, for the person who speaks Kru, stands for what is meant to us by the negative "no," used in answer to a question. And to both these theories, there is the objection that it is a far cry from these unconnected sounds, to the elaborate phonetic and grammatical structure that characterizes all known languages. It is also indicated that the earliest speech of man was a gesture language, and those who maintain this like to point to the sign-language of the American Indians. But to this claim, we may merely reply that this sign-language is anything but universally employed, and that it is as complicated and as highly styled as our speech. Far from being primitive, it should best be compared to the involved sign-language which deaf-mutes use in our own civilization. Once more, such a system needs explaining in terms of the conventions it employs. Thus, the sign that a Dahoman in West Africa makes to call a person, I interpreted in the light of our own use of gestures, so that I thought it meant that the person summoned was to go away!

Professor Sapir, indeed, in his discussion of language, in the book which takes that word for its title, disposes of all these theories in just four pages of his introductory chapter,¹⁰ as antecedent to his definition of language and his discussion of human speech. And that definition I can do no better than to quote here; it can be seen how succinctly it summarizes our argument as to this point:

"Language is a purely human and non-instinctive method of communicating ideas, emotions, and desires by means of a system of voluntarily produced symbols. These symbols are, in the first instance, auditory and they are produced by the so-called 'organs of speech.' There is no discernible instinctive basis in human speech as such, however much instinctive expression and the natural environment may serve as a stimulus for the development of certain elements of speech, however much instinctive tendencies, motor and other, may give a predetermined range or mould to linguistic expression. Such human or animal communication, if 'communication' it may be called, as is brought about by involuntary, instinctive cries is not, in our sense, language at all."¹¹

Let us, then have done with our attempt to find "the" origin of language. Let us see, first, what pre-history has to tell us as a basis of inference as to why and how man became a speaking animal, and then see something of what,

in linguistic science, we may look to to give us some idea of the manner in which speech, so to speak, "works."

Certainly the consideration of those changes in the human organism in its evolution that made speech possible are fascinating enough. There is no special reason, according to many authorities, why as far as the structure of the vocal cords and the mouth and nasal chambers of the head are concerned, the anthropoid apes could not make sufficient sounds to have a language. Nor, would it seem, is there insufficient room for the play of the tongue in the mouths of the higher anthropoids to deprive them of the use of that indispensable auxiliary to speech, though it cannot be gainsaid that the "u"-shape of the human dental arch gives our tongue freer play than does the rather "v"-shaped one of the higher ape-forms. The trouble with the apes, apparently, is the fact that their skulls must be so heavy that there is no room for the frontal lobes of the brain, in which the speech-centers seem to be localized, to develop. To quote Hooton's happy phrasing, "There is nothing about a snout which prevents its possessor from speaking, but there is something about the brain that goes with a snout which makes speech impossible."¹²

It has been stated that it was through his attainment of erect posture that man became human. Certainly, without erect posture man could never have developed the brain that must have preceded the development of speech. Whatever the case, coming to an upright posture had one undoubted effect; it lessened the necessity of man's having to have the enormous muscles in the region of the jaw and head that are essential to the ape to hold the great weight of an oversized jaw such as the gorilla, for example, possesses. Thus the expansion of the brain-case and the development of speech-centers was made possible. In a negative way as well, erect posture helped the development of speech. For when hands come into play, teeth need not be called upon for offense and defense in maintaining the individual's existence against his enemies. He is free to employ weapons. And by the same token, he may develop other grinding apparatus for his food which Hooton terms the "cheek teeth." Or, if we employ the phraseology of Jespersen, we may note that man's upright gait gives him two more limbs than a dog has, so that "he can carry things and yet jabber on," while "feeding takes less time in his case than in that of the cow, who has little time for anything else than chewing and a *moo now* and then."¹³

Thus we are so far along in our search for linguistic origins. But when did man actually begin to employ language, actually begin to speak? Here we enter the field of inference. The earliest human-like form, *Pithecanthropus Erectus*, if we judge by the endocranial casts that have been made of the interior of the skull-cap that represents all of its head we possess, same to show a degree of development of the speech centers of the brain that indicates a beginning had been made. The *Pitldown* form indicates somewhat greater capability in this respect, but even when we get to Neanderthal man, the precursor of *Cro-Magnon* who is *homo sapiens* as we ourselves are, the development is not as complete as it is in the later species. Indeed, according to Boule and Anthony, these Neanderthal forms had only a rudimentary form

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of speech,¹⁴ if any, though Hooton states that while "Neanderthal man's brain was a massive and primitive affair," it was yet "distinctly human."¹⁵

Did Neanderthal man have speech? We are perilously near the philosophical question as to whether thought may exist without speech, or whether language is a prerequisite to thought. For it is difficult to assume that Neanderthal man did not think. There is the use of fire that characterized his culture, and is found in no earlier European prehistoric civilization; there are the settled places of habitation that existed through millennia, to judge by the depth of the deposits in the sites from which artifacts that are associated with Neanderthal man have been recovered; there is the fact that he buried his dead with implements and with food, as I have mentioned, which indicates he had some notions concerning the hereafter. Perhaps it is best to be conservative. Let us agree with what we have said before; let us assume that he had rudimentary speech. Yet, even if we grant that language, we know it, only developed in the time of Cro-Magnon man, we are still some fifteen or twenty thousand years removed from the present day. And what cannot happen to anything in a period of time so vast; but above all, what cannot happen to something as changeable as human civilization? It is not difficult to see, when we remember what is known of the constant flux that characterizes the extra-biological, cultural, aspects of man's activities, why I laid such stress in the earlier part of my discussion on the principle that contemporary primitive man can in no way be regarded as living a life equivalent to that lived by our ancestors who have been dead these many millennia.

Perhaps one of the reasons that all the hypotheses of linguistic origin today seem so untenable to the person versed in the methodology of modern scientific endeavor, is because they result from the efforts of two groups of students who were working more or less intellectually isolated from one another. The early students of culture were cultivated men, but they were students of cultural processes and not language. The earlier linguists made amazing contributions to our knowledge of the interrelation of the historic tongues, especially the Indo-European languages, but they were not students of culture. The first group had no inkling of the wealth of difference in linguistic expression that mankind had devised, since they had not the technique to analyze the languages of the people of whom they wrote but, alas, rarely, if ever, visited. And in the case of the latter group, the linguists, these suffered from the fact that the lifting of the horizon which goes with the study of exotic cultures was not vouchsafed to them; they formed their hypotheses almost entirely on the basis of the study of a group of historically related tongues. It was not until the field ethnologist, equipped with linguistic training, began to collect the texts of the stories of the people he visited, phonetically recorded accounts of the life of the people as he obtained them from a native informant speaking his own language, that a body of material for the study of primitive language began to be available. It was not even until later, when those students who were not only equipped with ethnological field-training, but who were especially interested in the field of primitive linguistics, undertook to investigate the languages of primitive peoples, that we commenced really to understand on what

a precariously narrow ledge we had perched our theories about language and linguistic origins.

Thus, the search for origins today has given way to the investigation of the structure of definite languages, so that starting with this information as a base, research which has for its end an understanding of the actual contacts of peoples through comparison of the languages which have been studied may be prosecuted, and so that the changes in these languages under contact may also be known. Yet even in such an elementary matter as this, a point which should be of the greatest significance for those who seek linguistic origins comes to light. It is, once more, a point of method which bears a negative moral, but its value is none the less great because of this fact. It has to do with the search for a common tongue, ancestral to all present-day languages, and involves the nature of the structure of language itself. We owe it to Professor Boas, to whom we are indebted for so many cautions as to methodology.¹⁶ Language, after all, is a complex; something that, we may say, is not a "simple," a unit. There are the sounds that are used by the people who make it; the phonetics of the language. There are the combinations of those sounds; the words. And there are the ways in which the words are combined and re-combined the grammar, the idiom. May we assume that these are one? asks Professor Boas. Must we not recognize, as in the case with all cultural phenomena, that each component of a culture is really made up of parts historically independent, which may have come from different directions and yet have been assimilated into an organically unified whole?

Let me give an example from some work which I have been carrying on. A problem I have been studying is that of the New World Negro considered in relation to his Old World, his African, aboriginal stocks and their customs. We know, relatively speaking, where the Negro has come from, and, broadly speaking, we know his history in the New World. He has had contact with peoples of many different European stocks, having different customs and different languages as well as representing different physical types. There have been, in addition, the aboriginal Indians of the America, with whom the Negro has mingled his blood-stream and his cultural endowments. As a result, we find, in the New World, a number of Negro "dialects." There is a manner of speech, a type of expression, that is thought of and recognized as characteristically Negro. How did it come to be what it is? There are those who say that there is no African speech in the New World; that the English, for example, that is spoken by the American Negro, especially the Negro of such isolated regions as that of the Gulla Islands, off the Carolina Coast, is the English of Elizabethan times,¹⁷ just as the speech of the Tennessee mountaineers is that of the time and districts from which they migrated to come to this country and to the isolation of their mountains. Let us see whether such questions cannot be resolved into component subsidiary questions.

We may first consider the element of phonetics. What of the difficulty of the Negro to speak the "r" in our language? It is not impossible for Negroes to do this, for those born and trained in the North do not have "southern" dialect-speech. Yet it is true that all West African languages have difficulty

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with the "l"-*"r"* combination, and when I work with a West African native, if I take a word such as *"bla"* and repeat it as *"bra,"* and ask him if I have repeated it correctly, he will nod his head affirmatively, even though I repeat the two forms one after the other several times in sequence. But the dropping the *"r"* was characteristic of many English dialects spoken by the early White settlers of the South, and so we conclude that, in this one phase of Negro speech, we may be witnessing the phenomenon of the telescoping of cultural patterns from two civilizations; their coming together, in their aboriginal similarity, to make one thing to those who have been exposed to the two sets of patterns. Let me, in passing, give you another example of the independence of phonetics in linguistic structure. In my classes, in the semester just closed, is a graduate student who is Japanese. For one course, he has just handed me a term paper. Now, this man's English is not bad, and he is so advanced in his work that he is familiar with, and employs, German and French, as well as English. But what do I find when he typewrites English? I find *"enviloment"* for *"enviroment"*; *"pecurialities"* for *"peculiarities"*; *"Belrin"* for *"Berlin"*; *"recture"* for *"lecture,"* and so on. This man's vocabulary is adequate. His grammar, as we shall see, reflects the Japanese idiom somewhat. But each of these three aspects of the way he has learned English must be, for purposes of analysis, separated from the other two.

What of the aspect of language called vocabulary? Here again, if we return to examples taken from the study of the Negro, there are not many African words to be found in the New World. Although in the United States, the West Indies, and in South America, there were Negroes who came speaking languages which were based on the same phonetic systems, the combinations of the phonyms into words was so different that words themselves dropped away. Hence, though we have such a word as *"voodoo"* in the United States, and *"duppy"* or *"obia"* in Jamaica, actual Africanisms in words are not found in any great measure, although the more isolated the people, the greater the number of African words which are to be found. In this as in all considerations of the result of culture-contact, there is the phenomenon of telescoping to be watched for. Let me give two examples. One is from the Negroes of Dutch Guiana, the Bush-Negroes, who, in the deep forests of this South American colony, have established and maintained since their escape from slavery, a culture largely that of their African forbears. Let us take such a one of their words as *"gã,"* *"chief."* Now this, it has always been assumed, and I myself had assumed, came from the Spanish-Portuguese root for great, which, in English, is in our word *"grand."* Yet I find, when I investigate the language of the Fong and Ewe-speaking peoples who live in the heart of the West African region from which these people have come, that the word there for chief is *"gã."*

Another even better example is that comprised in our word *"Negro,"* the search for the origin of which leads us to a consideration of the term *"Jim Crow."* I dare say that many people have puzzled over this curious term for the Negro, and it was not until very recently that I found an American explanation for it. I asked a person who knows intimately the culture of the Gulla

Island natives of South Carolina about the phrase, and the reply to my question was, "Of course, I know what Jim Crow means. It means the buzzard." Now this is the last link in a long linguistic chain. In Dahomey, West Africa, there is one deity, a member of the Earth pantheon, who takes the offerings of a devotee to the other gods. This deity is visualized as the vulture, and—mark it well!—it is called by the name "Suninenge." What "nenge" means I never could find out, but I suspect that it is a term used to characterize black people, for reasons that involve a detailing of evidence I have neither the time nor space for here. In Dutch Guiana, however, "Nenge" or "Nengere," turns up as the name for Negroes, and, until recently, I, like everyone else, considered it as deriving from the Portuguese. Yet there were some difficulties. The "day-name" of the buzzard is the Sunday-name, "Kwasi," and I often heard small Negroes referred to as "little Kwashes." Now, the Ashanti term for vulture is "konkromo," and the name for the vulture in Dutch Guiana is, variously, "yankomo," "yankono," and "yankoro." The search next leads us to Jamaica. Here, the Negroes have dances that are semi-sacred and ceremonial, and, since the earliest days, these dances have been called in the literature by the name "John Canoe." It was not until recently that I had the privilege of hearing a Jamaican pronounce the word. It sounded like "Djā-koro," which is something of a cross, I think you will agree, between the Suriname term and the latter half of our own "Jim Crow." And between "Jim" and "John" there is no great distance. What then of our word Negro? Does it come from the Portuguese or from the African? My own feeling is that it probably is derived from both, and explains and is explained by the term "Jim Crow." And I offer this as an example of how word-changes may occur without disturbing the underlying thread that allows one to trace the historical adventures of the word, and how vocabulary changes may take place in transmission without affecting the underlying phonetic structure of the word. And I also offer this as an illustration of the difficulty inherent in the tracing of linguistic historic contacts, to say nothing of the difficulty present if we try to trace all language to its beginnings.

Let us now consider the third of these three elements of language, the grammatical structure. We can speak of this in terms of the "feel" of the language—its idiom. Permit me to refer once more to the paper of my Japanese student who, you will remember, confused the symbols on the keyboard of his typewriter in accordance with the way he confused the corresponding sounds in speech. If we realize that a language, in the hands of one who is foreign to it, offers one of the best ways to study the independence of idiom, we shall see the significance of the fact that, in his paper, this student employed but a pittance of "the's." The definite article is not a characteristic of Japanese; therefore, it does not appear in the English of this Japanese student. What does this mean, psychologically? It means that though the words be English, the thought, the idiom—above all—is in the native tongue of the speaker. That is why, in a book or letter, we can detect "German" English, or "French" English, as soon as we have read a page of such writing, and that is why, for one of us to learn "really" to speak one of these languages—that is, to learn to speak

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it idiomatically—is almost an insurmountable task. Yet failure to master idiom need not necessarily imply failure to master phonetics, or failure to learn vocabulary.

Examples of this lie among those folk who have had to learn language without proper instruction—the pidgin dialects, for instance. I do not believe it is correct to assume that the Chinese speak pidgin because they are incapable of learning English, and friends who know Chinese tell me that pidgin is a literal translation of the Chinese idiom into English. The same is true about the Africans, so that the English of the New World Negro is the result of a tenaciousness of idiom which has caused construction to hold on long after vocabulary had been left behind.

Let us take the matter of sex-gender. West African languages use "he" for man or woman, and, whether one hears Negroes in Africa or the Gulla Islands or Haiti speaking English or French, the habit of using only "he" persists, so we have a man saying, variously, "I married um (him)" or "C'est mon p'tit frere—c'est femme, eh?" When the Gulla Islander uses "suck he teet," meaning that the person shows contempt, there is no inkling given as to whether a man or a woman is performing the action. Certain idioms, I know, are pure African, for I have the phrase as they appear in West African dialect, with literal translations for them. I may list a few: "to study," something, for "to think," as in the spiritual, "We ain't gonna study Death no mo'" is one. To do something "more better" is another; the Haitian, or French-speaking West African says he does it "bien bon." The use of "too much" for "very much" is common, as when, in a folk-tale of American Negroes, a character says, "dat t'ing gi' me too much pledjuh already." "All-two" for "both" is again common, while the use of "make we go" for "let us go" is also found. In Guiana and the West Indies when Negroes wish to say "bring" they employ the phrase "take come," which is the exact translation of the Ashanti *fa bra*. If such a person is very hungry, he will say "hungry kills me" in spite of the fact that he is hundreds of years removed from his Ashanti-speaking relative who says, "*o kom oku mi*,"—"hunger kill me."

I could multiply examples of changes in this, as in the other two separate elements of language I have discussed, to great length, citing instances which come not only from the languages involved in this problem which I am engaged in studying but also from many other languages, would time and space permit me to do so. But what I have given suffices to make my meaning clear as to the point that linguistic change may be something much more complicated than is ordinarily thought, and that the interplay of contact may affect the language as a whole or influence it in only one or two of its facets. Of course, there are other aspects of human speech I may only mention. There are ways of expressing person, and tense, and gender which are complex beyond anything the English-speaking person can imagine, and yet are indispensable for the person who speaks the language where these complicated forms are the rule.¹⁸ There is tone—grammatically significant tone—so that phonemes are only one phase of the meaning-producing part of language, and tone the other. So involved can this become that, in the study of one West African tongue, Profes-

sor Sapir found that it was pattern of tone-inflection rather than phonetic pattern that furnished the underlying structure of conjugations and declensions.¹⁹

What, then, of linguistic origins? Let us not despair. If, through a careful intensive study of related languages, written and unwritten, greater relationships can be discerned, as they have been able to be seen among American Indian and certain groups of African tongues, then it may be, as Jespersen feels, that further empirical studies may work out even wider relationships. Whether the *Ursprache* will ever be discovered or not I do not know, and I confess, I do not much care. But of this much I am sure. If we ever do arrive at the facts as to how, in the dim past of humanity, language began to be spoken, it will be through the careful study of data which can be objectively considered, and not through the ratiocinations of an interested mind.

REFERENCES

- ¹ As examples of this point of view, see such work as L. H. Morgan's "Ancient Society," or E. B. Tyler's "Anthropology," or Crawley's "The Mystic Rose."
- ² For a résumé of the findings of the archaeologists, consult George Grant MacCurdy's "Human Origins."
- ³ The most telling critique of the evolutionary hypothesis of social development, especially in the field of social organization, is to be had in two works of Robert H. Lowie, "Culture and Ethnology," and "Primitive Society."
- ⁴ Otto Jespersen, "Language, its Nature, Development, and Origin."
- ⁵ Edward B. Tyler, "The Early History of Mankind," pp. 79-81.
- ⁶ Robert M. Yerkes and Ada W. Yerkes, "The Great Apes, a Study of Anthropoid Life."
- ⁷ Boutan, Louis, "Le Pseudo-langage." *Act. Soc. linn. Bordeaux*, vol. lxxvii, pp. 5-80.
- ⁸ *Op. cit.*, p. 302.
- ⁹ One investigation which attempts to understand, by means of a consideration of the animal cry and some of the findings of modern psychology, how speech might have developed, is contained in the volume "Speech, its Function and Development," by Grace A. de Laguna. Unfortunately, space does not permit me to do more than mention it here.
- ¹⁰ Edward Sapir, "Language, an Introduction to the Study of Speech," pp. 3-6.
- ¹¹ *Ibid.*, p. 7.
- ¹² Earnest A. Hooton, "Up from the Ape," p. 167. See the section entitled "Talking: getting a chin," pp. 164-174, for a fuller presentation of the point of view summarized in this and the succeeding paragraph.
- ¹³ *Op. cit.*, p. 413.
- ¹⁴ Quoted in Harris H. Wilder, "The Pedigree of the Human Race," p. 263.
- ¹⁵ *Op. cit.*, p. 333.
- ¹⁶ Franz Boas, "The Classification of American Languages," *American Anthropologist*, (n.s.) vol. xxii (1920), pp. 367-376, and "Classification of American Indian Languages," *Language*, vol. v, March, 1929.
- ¹⁷ Cf. Guy B. Johnson, "Folk Culture on St. Helena Island, South Carolina."
- ¹⁸ Cf. Sapir, *op. cit.*, *passim*, for numerous examples of these forms which, to the English-speaking person, seem so extraordinary.
- ¹⁹ Cf. "Notes on the Gweabo Language of Liberia," *Language*, vol. vii (1931), pp. 30-41.

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ASPECTS OF SIGMA XI*

JAMES E. ACKERT

The Association of Sigma Xi with collegiate institutions leads me to present a brief survey of early universities as a background for Sigma Xi. The origin of the first university is obscure but it is known that the University of Bologna (Italy) one of the oldest and most famous universities, was founded in the eleventh century as the outgrowth of organizations of students who employed their teachers. In most of these cases the teacher, besides giving instruction, furnished the class room, which afforded a collateral claim on the position.

Another of the early collegiate institutions, the University of Paris, was founded also in the eleventh century. It had its beginning in the schools of Notre Dame, Ste. Genevieve and St. Victor, and claimed a number of the great masters. In this university which attracted thousands of scholars from all parts of Europe and, in the middle ages, became the center of the educated world, occurred the formation, in 1257, of orders or "colleges" which besides affording lodging, care and instruction, developed fraternalism. The two most famous of these groups were the College of Navarre and the Sorbonne.

As was true of these institutions, the date of the inception of Oxford University (England) is unknown, but the records show that early in the twelfth century continentals were lecturing at Oxford. This university appears to have been founded by King Alfred. Its student body was materially enlarged by the immigration to Oxford of many foreign students expelled from the University of Paris. After a century another ancient university was started at Cambridge, England, less than 100 miles from Oxford. While this institution probably was the outgrowth of a church training school, its size was enhanced materially in 1209 when a large group of dissatisfied students left Oxford and went to Cambridge. Twenty years later an exodus of students from Paris joined the Cambridge group and from then on down through the centuries both Cambridge and Oxford developed by adding to each university independent fraternal college groups.

In 1631, Cambridge University graduated a young man named John Harvard. After receiving his Master's degree from Cambridge four years later young Harvard came to America as an assistant pastor at Charlestown, Mass. Within a year, however, his health failed and in 1638 he died of tuberculosis. Due to his stimulating influence and to the bequest of his library and a considerable amount of money to the small college which was being formed, the trustees named the school Harvard College. After a stormy beginning during which the first master, Nathaniel Eaton, was dismissed for misconduct, the college graduated in 1642 its first class consisting of nine students.

Fifty years elapsed before another college was started in the American colonies. In 1693 William and Mary College was founded at Williamsburg.

* Presidential address given at the annual initiation ceremonies of the Kansas State Chapter of Sigma Xi, Kansas State College, Manhattan, April, 1932.

Va. As early as 1619, or before the founding of Harvard College, grants of land had been obtained for the establishment of a collegiate institution near Richmond, but the plan was frustrated by the Indian Massacre of 1622. The plan was renewed in 1660 and thirty-three years later a charter for the college was secured from King William and Queen Mary of England. By receiving a penny a pound on exports of tobacco and by various other privileges William and Mary College attained rapid prosperity until the war of the Revolution when it lost its endowments and the occupation of its building by the contending groups (1781). But it recovered from these losses and began an important chapter in American education, claiming among its graduates, Presidents Jefferson, Monroe and Tyler, Chief Justice John Marshall and General Winfield Scott.

It was in this Virginia college that the first Greek letter fraternity was organized—Phi Beta Kappa, which had its inception as a secret social club and literary society in the year 1776. It soon became national when chapters were established at Yale in 1780, at Harvard in 1781, and at Dartmouth in 1787. In the fight against secret organizations it gave up its secret character and for half a century was the only college fraternity in the United States that was devoted to literature and philosophy. For many years Phi Beta Kappa days at commencements became noteworthy by the delivery of original orations and poems which had an important influence on the early literature of the United States.

As the scientific work of Darwin, Huxley, Pasteur, Virchow, Lister, Agassiz, and others began to invade the colleges, there were growing up in various institutions groups of students not eligible for Phi Beta Kappa which chose its representatives from the fields of the Arts and Philosophy. Then, too, Phi Beta Kappa elected on the basis of scholarship alone, whereas, some instructors began to consider that promise of research ability in one or more fields of science was more important than merely high scholarship. This trend was amplified by the passage of the Morrill Act in 1863 authorizing the establishment of land grant colleges, so much of whose work was to become scientific in character. As these colleges and other technological institutions were developing the need for another society became more urgent. Finally, at Cornell University in 1886, when Phi Beta Kappa was 110 years old, two engineers, William A. Day a Cornell senior, and Frank van Vleck of the Cornell University faculty planned the formation of an honorary scientific society which developed into Sigma Xi.

The growth of Sigma Xi has been phenomenal. During the first year chapters were granted to Stevens Institute of Technology, Hoboken, N. J.; Rutgers College, New Brunswick, N. J.; Rensselaer Polytechnic Institute, Troy, N. Y.; and Union College, Schenectady, New York. Two years later a chapter was installed at the University of Kansas (1889). The society has continued to grow until at present chapters occur in most of the states from Maine to California and from Michigan to Texas. There are now fifty-eight (sixty-two at time of this issue. *Ed.*) chapters of Sigma Xi in which members may be elected and twenty-eight Sigma Xi clubs which do not elect members.

During the various chapters new chapters at Western

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During the year 1930-31, 1,131 members and 785 associates were elected in the various chapters, while the grand total membership was 26,664. In 1930-31 chapters were installed at Harvard and Pittsburgh Universities and for 1932 new chapters include one at Princeton University, New Jersey, and another at Western Reserve University, Cleveland, Ohio.

Sigma and Xi are the initials of *Σπουδῶν Ξεθώνες*, which phrase signifies "companions in zealous research." The object of Sigma Xi is to encourage original investigation in science. Those beginning such investigations may well consider points that follow. The word "research" implies "another search" which involves ascertaining what has been written upon the subject in various languages, especially German and French. Thus, a ready reading knowledge of German and French should be acquired as soon as possible. This search for what is known upon a subject is facilitated by taking such courses as entomological and zoological literature, botanical literature, and chemical literature which largely are advanced courses in library methods. In the absence of such courses assistance may be secured from staff members, from the Engineering Societies Library, New York, the National Research Council, Washington, D. C., and from certain other collateral research organizations.

Having determined what is known about the problem, much time and effort should be given to outlining the method of attack upon it. If it be experimental, it is of great importance to so plan the work as to prove the point. This may require consultation with persons other than the one directing the work. The fraternal aspect of Sigma Xi facilitates consultation with one's colleagues in adjacent fields of science. While one should be reasonably secretive about his proposed investigative problems, his researches will be more effective if he consults, as fully as need be, workers in associated fields, who might give information that would obviate running a series of experiments. As soon as one experiment or phase of the problem is completed the data should be analyzed with a view of ascertaining if there are any special leads or trends in the results. Close scrutiny and meditation upon all possible relationships are of the greatest importance.

Among the tedious phases of research work is the written description of it. Before this is done, the author should ascertain whether or not the completed paper might be published. If so, to what particular journal should it be offered? Then, what is the character of this journal? Is it highly technical? Is it semi-popular? What are the interests of the readers of this journal or book? With this ascertained, the author may well begin his task of explaining his findings, clearly and concisely, in a style that will satisfy the majority of the readers of the journal.

Adherence to such a plan for preparing Masters' and Doctors' thesis would reduce greatly the bulkiness of such thesis many of which often are excessively long. Some authors consider that when the first draft of the descriptive matter has been completed, they are not quite half done with the task. Certain it is that most of the articles prepared for publication require repeated reading, editing and revision before they are ready to be published.

With a method of research thus outlined, the next point might well be how to accomplish it. The country is strewn with workers who have encountered fundamental problems, who have planned experiments and obtained some results but who never had quite the opportunity or the determination to complete them. I am reminded of a letter written several years ago by Dean J. T. Willard to a student who had published a short paper, recording a contribution to knowledge. Dean Willard complimented him on his forming so early in life the habit of making permanent records of his findings.

Obstacles of all sorts arise to interfere with research work: in the small college, lack of funds, extra-curricular activities, and isolation; in larger institutions, heavy instructional work and administrative duties. In either situation, the worker must carry on some researches in spite of his other duties both for his intellectual improvement and his professional advancement. If the person shows real ability to carry out research and publish the phases of it as they are completed, the other duties usually will be reduced and the research time increased. In other words, the younger person should plunge into his research in spite of everything. After a few years, recognition will be given, if not in his institution then in another that will want his services. The following case illustrates some of these points. A young instructor, after his days of teaching, spent his evenings studying the protozoa inhabiting wood-boring termites. These studies enabled him to compete successfully for a substantial fellowship which he held three years. During this time he continued his studies on these protozoa and discovered that the termites were unable to digest the wood they had swallowed without the aid of the protozoa in their intestines. The accomplishment of these researches won for him the joint award of the \$1,000 prize offered by the American Association for the Advancement of Science, and a call to the staff of a large university.

The volume of completed researches in this country including valuable industrial patents has been due in large measure to Sigma Xi in its various aspects. Among these may be mentioned the grants for research provided in part by the efforts of far-sighted members of Sigma Xi, the opening of new fields of investigation by collaboration of members in closely related departments, but especially by the continuous search for scientific truths by the army of Sigma Xi members in research institutes, collegiate institutions and industrial research laboratories.

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CLARENCE HENRY ECKLES

1875-1933

W. W. SWETT

Research has suffered an irreplaceable loss in the sudden passing of Dr. Clarence Henry Eckles whose death occurred on February 13, 1933, as a result of complications following an operation. A true pioneer in the field of dairy research, a leader in nearly every movement for the betterment of the dairy industry in the past thirty years, an inspiration to the scores of graduate students who have flocked to him in ever increasing numbers, he was one of the Master Minds in dairying and one of the industry's most beloved men.

He was born on a farm in Central Iowa on April 14, 1875. His father, Charles, came from England and, after serving in the Civil War as Captain in the Union Army, settled on what has since been the home farm. His mother, Elvira Powers Eckles, was a descendant of an early New England settler who came from England in 1654. After graduating from the Iowa State College in 1895, he continued his studies at the Iowa State College, the University of Wisconsin, and the Massachusetts Agricultural College, and was awarded a Master of Science degree by the Iowa State College in 1897.

In 1901 he went to Missouri to organize a dairy department at the State University. The year 1904-1905 was devoted to graduate study in Germany and Switzerland. Returning in 1905 he laid out a research program destined to bring fame not only to himself but to the University of Missouri. During the period from 1901 to 1919 he developed to a high state of efficiency the dairy department, which became the "Mecca" for graduate students in dairying, established a broad research program, and took the lead in developing the dairy industry of the State from a very small beginning to a point where its annual revenue from dairy products was approximately \$30,000,000. The record of his accomplishments since going to the University of Minnesota in 1919 is exceedingly bright. He played an important part in organizing the dairy industry of Minnesota and gained its respect and support, built a beautiful and adequately equipped dairy building and established a strong organization for research and graduate study.

Doctor Eckles embodied all that is meant by the word "Scientist." He was a true pioneer and was long at the front in the field of dairy research. To him accuracy was almost a religion and a careful record of every detail was of vital importance. He possessed an almost uncanny ability to foresee the problems of the dairy industry and be working on the solution of those problems oftentimes before others even recognized their existence. Anyone taking a problem to him for discussion was very likely to find he already had considered it, weighed its importance and made at least a mental outline of methods for solving it. There was no problem too great for him to undertake or too trivial for him to consider. Though much of his work was a practical nature designed to contribute directly to the improvement of the dairy cow, her



DR. CLARENCE HENRY ECKLES

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products, and the dairy industry in general he was fully appreciative of the value of the more basic scientific work and carried on many such problems. To him any contribution to knowledge was important.

The problems he has studied cover an extensive field, which includes the nutrition requirements for maintenance, growth, reproduction and lactation; factors affecting the composition of milk and butterfat; normal growth; crops for silage, silo capacities and silage molds, vitamins; importance of sunlight; the physiology of lactation; the bacteriology of milk; the composition of creamery butter; factors affecting reproduction; and a vast amount of work on the importance of minerals in relation to growth, lactation, reproduction and the general physiology of dairy cattle. He was the author of 109 scientific papers and a large number of popular articles. His book "Dairy Cattle and Milk Production" which appeared in 1911 was the outstanding text for dairy farmers and advanced students. A recent revision of this book includes the results of nearly fifteen years additional research and experience. "Dairy Farming" by Eckles and Warren is widely used by less advanced students. Only recently "Milk and Milk Products" by Eckles, Combs and Macy, has been published. This list illustrates the extent to which he gave his attention to a wide variety of subjects and shows that he was an authority in the field of dairy products as well as in the field of dairy cattle.

Great as his success in research has been, Doctor Eckles' greatest contribution undoubtedly was the inspiration he gave his students. In this field he stood alone. His aim in life was to uncover truth and he seldom made a statement he was not prepared to prove. He always used his vast fund of practical and scientific experience as a basis for his teaching. He himself was an intense and tireless worker and his patience was unlimited with a student who was making a true effort, but one simply trying to "get by" received little consideration. He inculcated truth and accuracy and stimulated the student to do his best. A student coming in contact with him for the first time was likely to be awed in his presence, for his fund of information, his enthusiasm, his sincerity, and his ability to size up a problem, brush aside unimportant details and shoot straight at the point, inspired a profound respect. But as the student came to know him better, affection was added to respect.

Eckles' former students are engaged in all branches and in all phases of the dairy industry. A survey of the records of the students who have taken major work under his personal direction, shows that thirteen Eckles-trained men are heads of dairy departments, and nineteen others hold professorial rank in dairy or animal husbandry in agricultural colleges or experiment stations. Sixteen others are engaged in scientific work associated with the dairy industry. One is Chief of the Federal Bureau of Dairy Industry, and eight others are engaged in scientific work in the United States Department of Agriculture—seven of whom are in the Bureau of Dairy Industry. Two are secretaries of National dairy breed associations. Four are engaged in editorial work with farm papers. Twenty-one are in agricultural extension work, several of these being in charge of dairy extension activities in their States. Twelve are operating dairy farms, and seventeen others are in com-

mercial work, with few exceptions in the dairy industry or in fields closely associated with it. These men are located in thirty-one different States, the District of Columbia, India, Porto Rico, the Philippines, England and Denmark. The indirect influence of Doctor Eckles' contributions to the dairy industry of the world, through his inspiration to these men is of inestimable and ever-increasing value.

Doctor Eckles exemplified leadership, and he led by setting an example rather than pointing the direction. Not only did he lead the way in research and teaching but he took an active part in nearly every movement for the betterment of the industry. He was one of the organizers of the Official Dairy Instructors' Association, which later became the American Dairy Science Association, now having more than 400 members representing all branches of the industry, and served for four years as its president. He was one of the first to advocate and use proved dairy sires. He had much to do with the rules governing the official testing of cows. When the movement for conducting dairy cattle judging contests was started in 1907 he trained a team—the only one "competing" that year. But although he was an early supporter of dairy cattle judging he was one of the first to recognize the fact that judging was not based on a scientific foundation and for twenty years declined all invitations to act as judge of dairy cattle. He has served on National committees having to do with almost every phase of dairy cattle and dairy products work.

Many honors came to Doctor Eckles. He was one of the first men in the dairy industry to have the distinction of appearing in "Who's Who in America." In 1916 the Iowa State College awarded him the honorary degree of Doctor of Science. He attended the World's Dairy Congress in London in 1928 and was an official delegate of the United States Government at the World Dairy Congress at Copenhagen in 1931. In 1928 he was selected by a committee of fifty-six leaders representing all branches of the industry, as one of the "Ten Master Minds of Dairying." He took an active part in the affairs of Sigma Xi, Gamma Sigma Delta, Alpha Zeta, and a number of other scientific and scholastic organizations.

An honor particularly close to his heart came to him in January, 1932, when, before the assembled dairymen of Minnesota, the Eckles Club, an organization of Eckles' former students formed in his honor, presented with appropriate ceremony an oil portrait of its chief, for hanging in the administration building at the State University. Eckles' achievements and the esteem of his associates at Minnesota are beautifully expressed in Dean Coffey's remarks on that occasion:

"I doubt if any other man in agricultural education now or in the past has trained as many men who have risen to responsible positions as has Professor Eckles. His standing in the educational field as it relates to dairying is unequalled, and his influence in that field now is profound. He is quite unassuming, always modest, always cheerful, always fair. His power lies in keeping his well trained mind at work on objectives he clearly understands, and in giving all he has to his position and to the young men who work and

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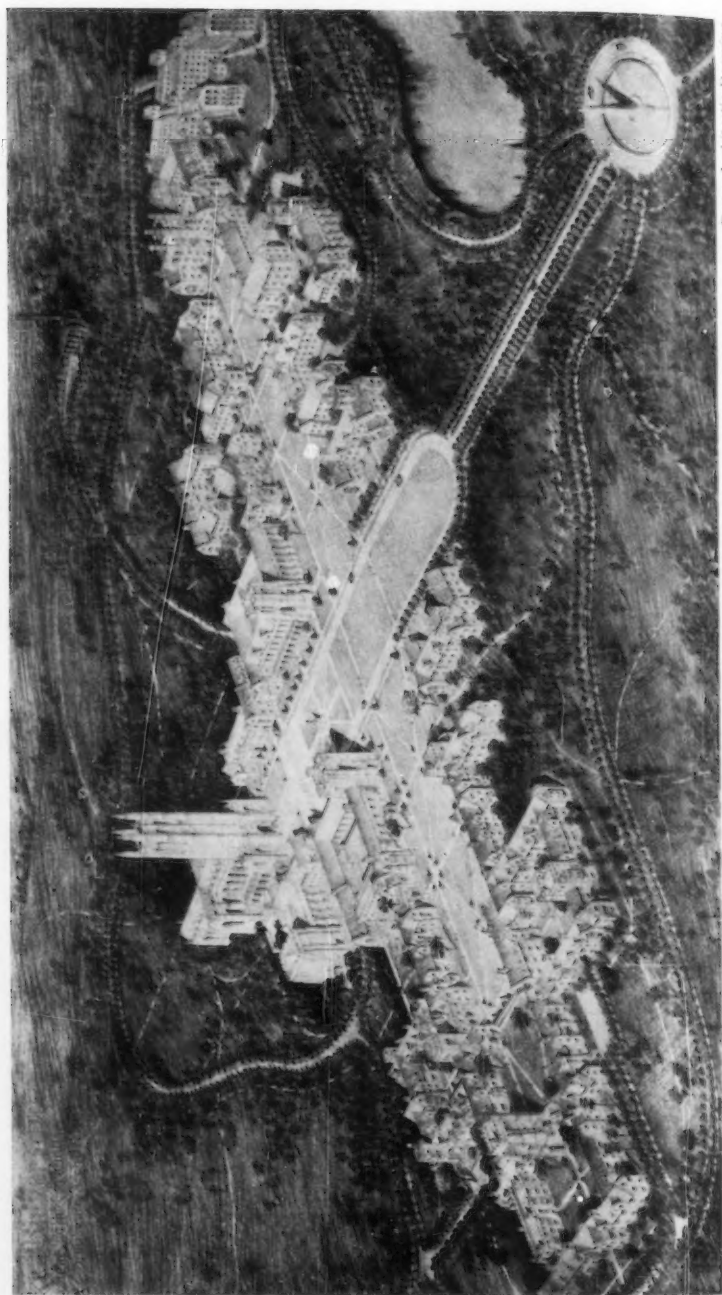
"In these young men who constitute the Eckles Club, he has accumulated great riches which will continue to grow as he unselfishly shares them with the world. How paltry is mere money beside them! It is with this feeling—a feeling, by the way, to which every member of the faculty on this campus would instantly subscribe—that I accept this portrait for the Department of Agriculture, University of Minnesota."

Natural, sincere, unassuming, retiring—almost bashful—he remained entirely unspoiled by his success and the many honors that came to him. He possessed a remarkable ability to concentrate and unfortunately some who did not know him well mistook his intense concentration for lack of friendliness. He did not make friends easily, but once a friendship was established it was enduring. Those who knew him best loved him most for as Dean Coffey said, "With him the course of friendship runs deep." His chief relaxation was reading. He was a great lover of good books and a tireless reader in a wide variety of subjects—particularly history and biography. Fishing was the one form of recreation that took him away from everything pertaining to his research, teaching and administrative duties. For one month each year he dropped everything and went fishing. The annual house party which he and Mrs. Eckles gave at their camp on a lake in Northern Minnesota was a never-to-be-forgotten incident in the lives of his graduate students.

Not only was Doctor Eckles highly regarded as a teacher, but he was dearly beloved as a personal adviser. Hundreds went to him for advice and those who followed it nearly always found it leading to success and satisfaction. Despite the ever-increasing demand on his time for research, teaching and administration he always remained accessible to his former students. He took a real interest in their personal problems and helped to solve them. Many times he gave financial support through personal loans to help them accomplish a worthy desire. Many a man owes his success to Doctor Eckles, for in scores of cases he found jobs for students coming to college without adequate funds, and gave them the encouragement they needed at a critical time. Not only will his influence be missed by the industry to which he devoted his life, but he will be sadly mourned by those who found him to be a personal adviser, a benefactor, and a true friend.

Without a doubt one of the greatest factors contributing to his success, was his ideal home life. Any attempt to picture his character and attainments would be grossly incomplete without a reference to the part played by Mrs. Eckles. For almost thirty-four years she graciously managed his home and encouraged him in his work. They took great pride in their three children, Doris, Charles and Ruth, all of whom are grown, graduated from college and established in homes of their own. Quiet, unassuming and sound in judgment like himself, she shared her husband's problems and his honors, and was not only an inspiration to him but provided a wholesome motherly influence for the young men who came to him for training and advice. Her pride in the

[Please turn to page 95]



From Architect's Drawings

PAUL P. BIGELOW, VICE-CHANCELLOR OF DUKE UNIVERSITY

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INSTALLATION OF THE DUKE CHAPTER

JULIA DALE

The sixty-first chapter of the Society of Sigma Xi was established at Duke University on Friday, March 31, 1933. The installation program started at two o'clock with exhibitions and open houses in all science departments. About seventy-five scientists from Duke and the neighboring institutions were present for the installation ceremony, which was held in the Biology Building. Two of the national officers, Dean Edward Ellery and Prof. George B. Pegram, were present.

At the installation ceremony Prof. George T. Hargitt read the petition, and the charter, authorizing the establishment of the new chapter at Duke, was presented by the National Treasurer, Prof. George B. Pegram, to Prof. L. A. Bigelow, President-elect of the Duke Chapter. The National Treasurer gave the charge to the chapter. The National Secretary, Dean Ellery, answered questions concerning details of the local organization. Officers of the Duke Chapter were elected as follows: President, L. A. Bigelow; Vice-president, Ruth Addoms; Secretary, J. B. Rhine; Treasurer, Bert Cunningham; Executive Committee, H. C. Bird, W. M. Nielsen; Membership Committee, A. S. Pearse, Julia Dale, to serve for three years; C. F. Korstian, H. L. Blomquist, to serve two years; F. W. Constant and D. C. Hill to serve one year. President Bigelow took the chair and presented the by-laws of the local organization which were adopted.

The installation dinner was held at the Union on the West Campus. About sixty members and representatives from other chapters were present. Prof. W. M. Nielsen presided. The first speaker was President Few of Duke University. President Few congratulated the members on their success in obtaining a chapter at Duke University and in behalf of the University welcomed the guests and representatives of other chapters. Dean Ellery brought greetings from the Executive Committee as well as the Union chapter. Professor Nielsen then read greetings from the following institutions: University of Wyoming, Pennsylvania State College, Lehigh, Syracuse, Rochester, and Rutgers. Prof. H. V. Wilson of the University of North Carolina recalled some of his experiences in the early days of the University of North Carolina and Trinity College. He closed with a message of encouragement to all scientists engaged in research. Pres. L. A. Bigelow spoke of his hopes and plans for the progress of the new chapter. The installation program closed with an address by Prof. George B. Pegram of Columbia University, on "A Year of Modern Alchemy."

The list of members and associates of the Duke chapter at the time of the installation is as follows: Ruth M. Addoms, Harold Amoss, Lowell Besley, L. A. Bigelow, Harold C. Bird, H. L. Blomquist, Miss Frances C. Brown, Helen E. Butts, Leonard Carlitz, F. W. Constant, Bert Cunningham, F. R. Darkis, W. C. Davison, Julia Dale, W. W. Elliott, J. W. Everett, Harold Finkelstein, I. E. Gray, J. A. Greenwood, F. G. Hall, Geo. T. Hargitt,

C. C. Hatley, C. R. Hauser, D. C. Hetherington, A. O. Hickson, D. C. Hill, D. L. Hopkins, Christopher Johnson, C. F. Korstian, Paul Kramer, F. D. McCrea, D. S. Martin, A. C. Mathews, J. C. Mouzon, W. M. Nielsen, X. J. Ooeting, H. S. Perry, A. B. Pearse, J. B. Rhine, J. H. Roberts, Walter J. Seeley, F. H. Swett, H. M. Taylor, J. M. Thomas, W. C. Vosburgh, F. A. Wolf.

INSTALLATION OF THE CALIFORNIA CHAPTER AT LOS ANGELES

E. K. SOPER

On April 25, 1933, the Sigma Xi Club of the University of California at Los Angeles became the California Chapter at Los Angeles, amid much enthusiasm and good-will on the part of the seventy-five or more members and associates who were present. The installing officers were Prof. Charles J. Chamberlin of the University of Chicago and Dr. John A. Anderson, Astronomer of the Mt. Wilson Observatory and of the California Institute of Technology.

The formal address in connection with the installation was delivered in the afternoon by Prof. Charles J. Chamberlin who chose for his subject, "The Scientific and Cultural Value of Travel." This lecture, which was open to the public, was attended by a large number of persons in addition to the members of the Sigma Xi Club of the University of California at Los Angeles, and other members of Sigma Xi residing in Southern California.

Members of the Sigma Xi Club of the University of California at Los Angeles and their guests met in the evening at an installation dinner in Kerckhoff Hall on the campus, after which the formal installation program took place.

Immediately following the installation, the members of the new chapter held a business meeting at which the following officers were elected for the ensuing year.

S. J. Barnett, *President*
B. M. Varney, *Vice-president*
E. K. Soper, *Secretary*
H. W. Stone, *Treasurer*

B. M. Allen
H. W. Edwards
S. I. Franz
Glenn James
E. R. Hedric
O. L. Sponsler
Helen B. Thompson

Members of the Electoral Council

The complete list of the sixty-nine Charter Members of the newly formed California Chapter at Los Angeles is as follows:

Bennet M. Allen	Grace M. Fernald	Orda A. Plunkett
Ruth Anderson	Shepherd Ivory Franz	Henry J. Quayle
Gordon H. Ball	Raymond Garver	James B. Ramsey
Samuel J. Barnett	Joseph A. Gengerelli	G. Ross Robertson
Emily M. Bartlett	Howard Gilhousen	Flora Murray Scott
Almon J. Basinger	Verz R. Goddard	George E. F. Sherwood
Josephine D. Beckwith	U. S. Grant, IV	Walter B. Sinclair
Theodore D. Beckwith	Arthur W. Haupt	Harry S. Smith
Clifford Bell	Earle R. Hedrick	Ralph H. Smith
Albert W. Bellamy	Robert W. Hodgson	Edgar K. Soper
Francis E. Blacet	William T. Horne	Olenus L. Sponsler
Alfred M. Boyce	Glenn James	Hosmer W. Stone
Sidney H. Cameron	Arthur M. Johnson	Ellen B. Sullivan
Homer D. Chapman	Leo J. Klatz	Helen B. Thompson
Ira J. Condit	Vern O. Knudsen	Phillip H. Timberlake
Frederick W. Cozens	Edgar L. Lazier	Ralph L. Tracy
Paul H. Daus	Frederick C. Leonard	Burton M. Varney
Leo P. Delsasso	Myrta Lisle McClellan	Arthur H. Warner
Laurence E. Dodd	H. G. MacMillan	Walter B. Welch
Max S. Dunn	Loye H. Miller	Alfred R. Whitman
Hiram W. Edwards	William John Miller	William M. Whyburn
Joseph W. Ellis	William Conger Morgan	William G. Young
Carl C. Epling	John W. Olmsted	Clifford M. Zierer

CLARENCE HENRY ECKLES

[From page 91]

accomplishments of her husband and his students and associates is boundless. Doctor and Mrs. Eckles shared equally the esteem and affection of all who were fortunate enough to know them intimately.

In the thirty-seven years since his graduation from college Doctor Eckles started more men to prominent and responsible positions in the dairy industry than any other person; he led the way in research that has been of incalculable value to the industry, and he added dignity to dairying as a profession. Truly he was deserving of the genuine satisfaction that must have resulted from the fact that, during his lifetime, his greatness was recognized. And this brings to mind Dr. J. R. Mohler's recent analysis of the different types of human greatness, which he brings to a climax with a description of "the highest kind of greatness—the kind that is infectious in a benevolent manner, spreading enthusiasm, high ideals, and a desire to attain similar success." He calls it a "genetic" greatness for it perpetuates its kind so extensively. This description fits Doctor Eckles perfectly.

CHAPTER OFFICERS

List Furnished by the Secretaries of the Chapters

CHAPTER	PRESIDENT	VICE-PRESIDENT	SECRETARY	TREASURER
Cornell	Robert Matheson	L. A. Maynard	G. E. Grantham	A. J. Henn
Rensselaer	E. G. Allen	A. W. Bray	F. M. Sebast	H. E. Stevens
Union	C. B. Hurd	E. S. C. Smith	F. J. Studer	F. J. Studer
Kansas	H. H. Lane	C. M. Young	E. L. Trece	H. E. Jordan
Yale	I. V. Hiscock	L. E. Seeley	R. K. Warner	R. D. Coghill
Minnesota	D. G. Paterson	G. O. Burr	F. B. Hutt	Alice Biester
Nebraska	B. C. Hendricks	T. A. Kiesselbach	E. N. Anderson	F. A. Hitchcock
Ohio	J. F. Lyman	E. M. Spieker	F. A. Hitchcock	F. A. Hitchcock
Pennsylvania	H. C. Bazett	C. P. Olivier	E. P. Helwig	P. A. Caris
Brown	A. A. Bennett	R. B. Lindsay	G. L. Church	W. R. Benis
Iowa	J. H. Bodine	J. A. Eldridge	A. C. Tester	Roscoe Woods
Stanford	G. J. Pierce	J. W. McBain	C. P. Stone	C. P. Stone
California	T. H. Goodspeed	E. O. Lawrence	G. E. Troxell	S. F. Cook
Columbia	D. E. Lancefield	J. S. Morgan	G. M. Kay	G. M. Kay
Chicago	E. S. Bastin	E. J. Kraus	W. Barty	J. B. Hing
Michigan	A. H. White	E. H. Kraus	O. F. Duffendack	S. S. Atwood
Illinois	F. L. Stevens	H. Woodrow	R. F. Paton	R. C. Fuson
Case	H. B. Dates	C. L. Eddy	T. D. Owens	T. M. Focke
Indiana	H. T. Briscoe	E. L. Yeager	P. M. Harmon	P. Weatherman
Missouri	M. M. Ellis	M. J. Guthrie	F. F. McKenzie	G. F. Brecken
Colorado	J. W. Broxon	E. H. Brunquist	H. B. Van Valkenburgh	W. K. Nelson
Northwestern	R. H. Gault	A. C. Ivy	H. B. Ward	M. Carlson
Syracuse	D. P. Randall	C. C. Carpenter	R. R. Hirt	E. T. Aptel
Wisconsin	F. Daniels	J. Stebbins	J. B. Kommers	H. R. Aldrich
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EDWARD ELLERY,

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Union College,
Schenectady, N. Y.